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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/562,072	12/21/2005	Michael Andrew Yuratich	MRKS/0142	3875

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EXAMINER	
COMLEY, ALEXANDER BRYANT	
ART UNIT	PAPER NUMBER
3746	
MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/562,072	YURATICH, MICHAEL ANDREW	
	Examiner	Art Unit	
	ALEXANDER COMLEY	3746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 July 2011*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *39-53* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *39-53* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 December 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 7/18/2011 has been entered.

Status of the Claims

2. Examiner acknowledges receipt of Applicant's amendments and arguments filed with the Office on June 10th, 2011 in response to Final Office Action mailed on April 11th, 2011. Per Applicant's response, Claim 39 has been amended, while Claim 53 has been newly-added. Claims 1-38 remain cancelled due to a prior amendment. Consequently, Claims 39-53 now remain for prosecution in the instant application and currently being examined. The Examiner has carefully considered each of Applicant's amendments and/or arguments, and they shall be addressed below.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. **Claims 39- 53** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 39 and 53 each recite the limitation "the sinewave" in lines 11 and 9, respectively. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. **Claims 39-52** are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent No. 5,844,397 to Konecny et al in view of United States Patent No. 5,969,498 to Cooke.

In regards to Independent **Claims 39 & 53**, Konecny et al. discloses an improved downhole pumping system and method thereof which employs a variable speed PWM

(pulse-width modulated) inverter and transformer setup in order to smoothly drive an induction (i.e. three-phase) motor over a range of different speeds (i.e. speed control means) (See Col. 1, Lines 12-18) More specifically, Konecny discloses variable voltage supply means for supplying a voltage that can be varied as required (See Col. 4, lines 58-68) Applicant does not claim what factors the voltage must be varied upon, and as such, Konecny's varying of the voltage based on input AC voltage meets the claimed limitation. Konecny also discloses the use of a PWM inverter drive module 608 for producing modulated cyclic waveforms that switch between upper and lower voltage levels. In particular, Konecny states, "One approach that is used to develop rectangular voltage signals for PWM drives is the "sine-triangle" scheme. As shown in FIG. 3, this method designates high and low periods of a rectangular voltage signal 300 based upon the intersection between a triangular wave 302 having the desired chopping frequency (f.sub.PWM), and a sinusoidal signal 304 having the desired electrical driving frequency of the motor (f.sub..omega.). The rectangular signal 300 is (1) high when the sinusoidal signal 304 is greater than the triangular wave 302, and (2) low when the sinusoidal signal 304 is less than the triangular wave 302." (Col. 2, Lines 24-34) Controller 612, power supply 614, and operator interface 616 (see Figure 6) collectively form a drive means for operating the inverter means to generate said cyclically varying waveforms (see col. 5, lines 4-33). With reference to figures 3-4, Konecny shows extended periods (300, 400) of substantially continuous voltage at each of the maximum and minimum voltage levels of the cyclic sinusoidal signal (302, 404). It is apparent from these figures that the sinusoidal signal is a non-linear control method (i.e. Figures 3 and 4), and

furthermore, the non-linear sinusoidal signal non-linearly modulates the rectangular voltage levels in order to control the PWM supplied to the motor (i.e. speed control is directly regulated). Hence, Figures 3 and 4 appear to show known PWM systems that transition between high and low voltage levels utilizing non-linear modulation techniques (i.e. sinusoidal signals). Moreover, it is clear that the PWM drive circuit utilizes high and low voltage levels for different periods of time in order to drive the motor at different speeds. Thus, Konecny's system utilizes a variable speed, variable voltage inverter drive system for downhole submersible pumps in which the voltage signals that are input to the inverter (i.e. PWM generator) can accurately and efficiently drive the pump. However, although Konecny appears to disclose the vast majority of Applicant's claimed invention, it does not appear to specifically disclose the use of over-modulation techniques for the waveforms in order to prevent the waveforms from following a sine wave shape.

However, although Konecny does not disclose the use of over-modulation, the Cooke portion of the combination successfully discloses the known use of such modulation techniques specifically for the same type of 3-phase, induction motors described in Konecny. To begin, Cooke describes a controller for variable speed 3-phase induction motors that is designed to provide more accurate control over the

speed

of the motor while minimizing energy waste (see Abstract; col. 1, lines 42-63). Cooke's system, like Konecny's, utilizes a PWM modulator with an asynchronous sine-wave oscillator to drive the motor (see col. 2, lines 53-67) Cooke even describes a specific

pump application in which accurate steady state speed control is desirable (i.e. downhole pumps; see col. 1, line 64 - col. 2, line 4) Most importantly, however, is Cooke's specific disclosure of over-modulation techniques that prevent the waveforms from following the sine wave (i.e. the triangle peaks exceed the reference peaks; see col. 3, lines 31-38). Such over-modulation techniques produce high harmonics, but are offset by increased motor cooling effects (see col. 3, lines 59-61). Thus, it is apparent that Cooke discloses the known usage of over-modulation techniques for 3-phase induction motors utilized in the driving of steady-speed pumps (i.e. submersible, downhole pumps). Therefore, to one of ordinary skill desiring a submersible pump with better motor cooling effects, it would have been obvious to utilize the techniques disclosed in Cooke in combination with those seen in Konecny in order to obtain such a result. Consequently, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the controller system/method of Konecny with the additional over-modulation techniques seen in Cooke's controller logic, when desirable, in order to obtain predictable results; those results being an efficiently monitored induction motor that can provide increased motor cooling through well-known over-modulation techniques.

5. In regards to dependent **Claims 40 & 46**, Konecny's three-phase power supply 602 drives all phases (3 phases) of the motor simultaneously (See Col. 2, Lines 13-34) Furthermore, the transformer of Konecny's drive circuit acts as a poly-phase boost converter (i.e. step-up converter). In particular, Konecny states "Typically, the variable

speed drive and a drive controller of a selected type are operatively connected between the power line and a transformer. The transformer is utilized to drive the motor, and more particularly to step up the level of voltage and reduce the current supplied to the motor. This is especially important in applications such as downhole pumping operations, where a long cable connects the transformer to the motor; in these situations, the transformer helps prevent excessive current from flowing in the long cable." (Col. 1, Lines 53-61) In regards to dependent **Claim 41**, Konecny discloses a unique start-up routine (i.e. low motor speed) for linearly ramping up the current supplied to the motor to preset values of current (see col. 3, lines 55-62). In regards to dependent **Claims 42-43 & 47**, Konecny's invention is specifically aimed at providing a pulse-width-modulated time-dependent sequence in order to smooth out the voltage transitions through a range of different motor speeds (i.e. high speeds). (See Col. 2, Lines 13-34; Col. 3, Lines 42-51; Col. 4, Line 58- Col. 5, Line 8; Abstract) Konecny also specifically states that the frequency of the variable voltage source is varied with the output of a chopping mechanism (See Abstract; col. 2, lines 25-35; col. 3, line 63 – col. 4, line 8) In regards to dependent **Claims 44-45**, and with particular reference to Figure 7A-1, Konecny discloses the use of two capacitors (706, 708) connected to first and second supply voltage sources (701, 702), and selections means (705) designed to selectively vary the voltage (based on the duty cycle) supplied by the buses (701, 702) (See Col. 5, Lines 44-67) Regarding dependent **Claim 48**, Konecny specifically discloses a transformer with first and second windings (See Col. 6, Lines 35-57). In regards to dependent **Claim 49**, Konecny clearly discloses the use of a filter in Figures

6-7 (Also see Col. 5, Lines 33-56) In regards to dependent **Claim 50**, Konecny specifically discloses the use of filter means adapted to supply sinusoidal voltage signals (see col. 5, lines 44-67) Regarding dependent **Claims 51-52**, it is apparent from previous disclosures that Konecny varies the input power (i.e. voltage) to the motor in order to match a desired speed based on required pumping capacity (i.e. load). The inverter 608 and controller 612 (i.e. means for controlling output power) monitor/control the amplitude and frequency of the control signals (i.e. output power) needed in the circuit and thereby supply the required phase/voltage/current (i.e. minimum allowable power) to the motor (see col. 5, lines 3-33) Konecny even goes on to describe the drive routine of the motor, and how it calculates the required driving frequency of the motor (i.e. minimum/maximum power or speed) in order to obtain a desired pump operation (i.e. user-defined speed) (See col. 8, line 20 - col. 9, line 26) As such, Konecny's drive system monitors the control circuitry in order to provide maximum pump output with minimal power consumption/waste.

Response to Arguments

6. Applicant's arguments with respect to claims 39-53 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEXANDER COMLEY whose telephone number is

(571)270-3772. The examiner can normally be reached on M-F 7:30am - 5:00am EST (Alternate Fridays Off). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Devon C. Kramer can be reached on (571)-272-7118. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Alexander B Comley/
Examiner, Art Unit 3746

/Devon C Kramer/
Supervisory Patent Examiner, Art Unit 3746

ABC